

Contributions to the palaeontology of the Yea area, central Victoria: I. the fossil coral *Pleurodictyum megastoma*

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Abstract

The tabulate coral *Pleurodictyum megastoma* McCoy is one of the most characteristic fossils of the Late Silurian to Early Devonian marine sedimentary rocks of central Victoria, Australia. This is the first record of occurrences of this fossil in the distal turbidite facies of the Yea area, which have previously been controversially dated as Late Silurian. Two of the three localities at which it has been found appear to contain Early Devonian fossil assemblages typical of central Victoria. A lectotype specimen of *P. megastoma* is designated and assigned a Pragian-Emsian (Early Devonian) age but other specimens have been recorded from Silurian sediments. (*The Victorian Naturalist* 124 (5), 2007, 288-295)

Introduction

The fossil coral *Pleurodictyum megastoma* was first named in a French translation of some notes by McCoy (1866), produced as a pamphlet for the Intercolonial Exhibition of Australasia held in Melbourne from 23 October 1866 to 9 February 1867. It has since received attention in a number of papers, notably those by Withers (1932) and Neil (1985). Moulds of this coral occur widely in marine sediments of Siluro-Devonian age in the Melbourne and Tabberabbera Zones of central Victoria. It is immediately recognisable, in its most characteristic form, by the circular outline of the corallum which is made up of large polygonal corallites, radially lengthened the further they are from the centre, and connected by large pores. Entire specimens of this distinctive coral are commonly found; one illustrated by Neil (1985) has 40 corallites and measures 4.5 cm across.

The Yea area has long been known to contain marine clastic sediments of Siluro-Devonian age (Couper 1965). A fold structure, the Yea Anticline, reportedly contains the oldest fossils, which are graptolites of Ludlow-Pridoli (Late Silurian) age (Garratt 1978; Garratt and Rickards 1984, 1987; Rickards and Garratt 1990; Rickards 2000), and elsewhere in this area are found graptolites of Pragian (Early Devonian) age (Jaeger 1966; Garratt 1978). The Late Silurian date is controversial (Hueber 1992; Rickards 2000) because of the occurrence of the advanced fossil plant *Baragwanathia* with the graptolites.

Similar plants are not known elsewhere until the Early Devonian.

As part of research into the stratigraphic context of the *Baragwanathia* flora, a detailed field study has been made of the Yea area. This has resulted in the finding of a number of localities at which moulds of identifiable calcareous fossils occur. There has been no previous substantial report of such fossils from the Yea area, which has generally been perceived as being fairly barren apart from the few plant-graptolite localities. This is because the sediments are deep-water shales (which contained no resident calcareous organisms) and turbidite sandstones (in which fossils are too fragmented to identify). The very rare Yea specimens of *Pleurodictyum* represent individuals which have been preserved by fortuitous circumstances in the midst of unfavourable conditions. By contrast, the previously well-known occurrences of *Pleurodictyum* are usually from mudstones, or other relatively near-shore sediments, where the animals either grew on the spot or were transported relatively short distances.

All fossil specimens and localities described in this paper are registered with Museum Victoria, denoted by registration numbers beginning NMV P and PL respectively.

Previous Studies

The sediments of the Yea area were originally described as Upper Silurian because of a general lithological similarity with

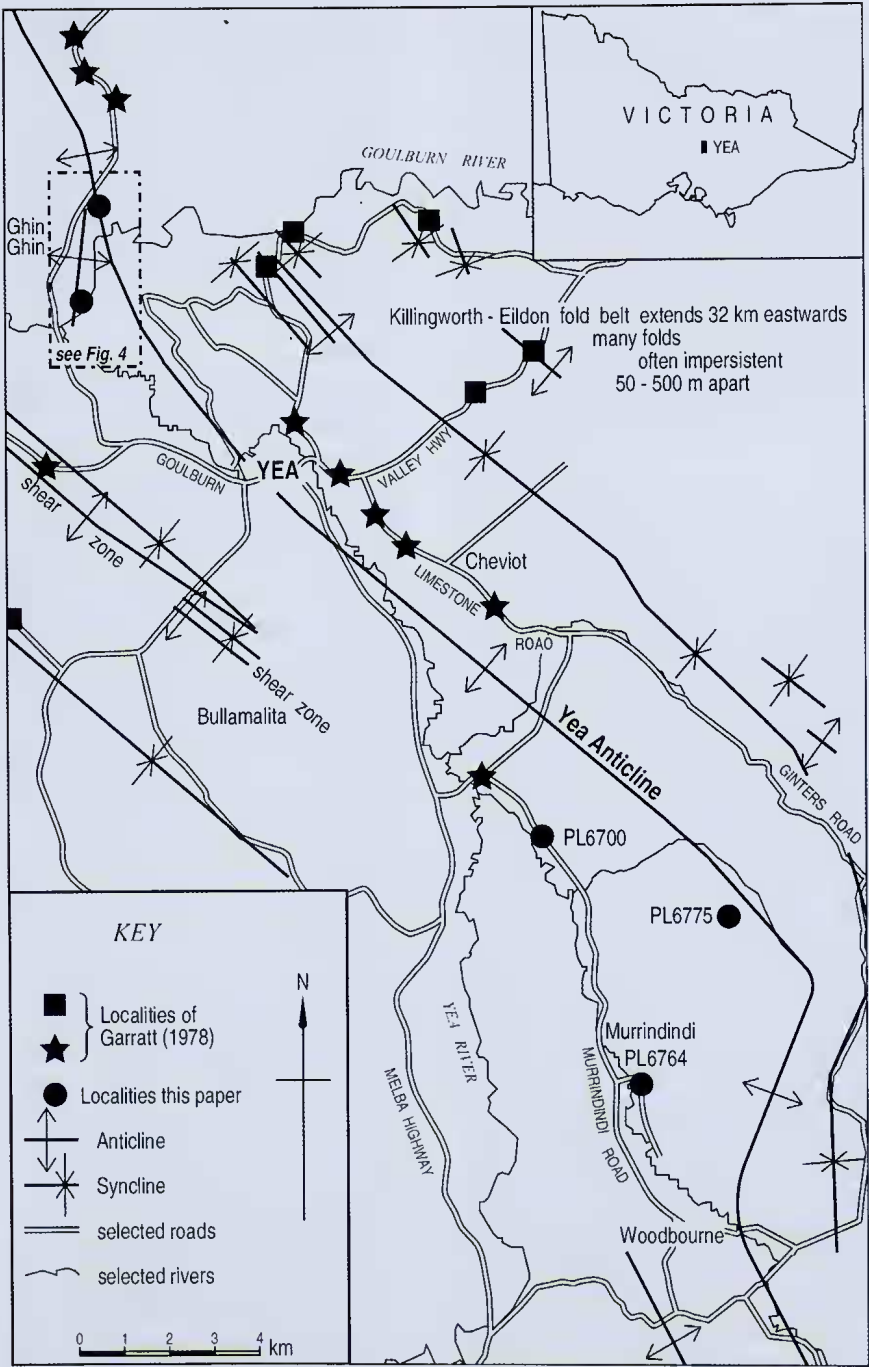


Fig. 1. Structural map of the Yea district showing the position of localities mentioned in the text. To facilitate comparison with previous papers on the geology of the Yea area, localities of Garratt (1978) have also been marked.

other strata in central Victoria, especially the absence of pronounced metamorphism (Selwyn and Ulrich 1866). Stirling (1895) reported Upper Silurian shelly fossils from a locality probably identical with NMV PL6765 of this paper. A study of the plant-graptolite fossil assemblage reported the close similarity of the distal turbidite and shale lithology of the Yea area to that of the Upper Yarra and Thomson River districts (Harris and Thomas 1941). 'Upper Silurian' in all these early studies corresponds with the Late Silurian-Early Devonian of current terminology.

Couper (1965) made the first detailed study of the Yea district and divided the sediments into three units labelled A, B and C. However, Couper's stratigraphy, although broadly correct, is not valid because it considers ill-defined fossil assemblages to delineate lithostratigraphic horizons. The consequences are particularly apparent on his mapping of the western limb of the Yea Anticline, where conglomerate and coarse sandstone (his loc. 64) are mapped on strike with laminated claystone (loc. 63), in contravention of lithostratigraphic principles, resulting in a considerable distortion of the boundaries of Unit A. Nevertheless, Couper's stratigraphy was accepted by Garratt (1978) with minor modifications, and the oldest unit, Unit A, was renamed the Yea Formation. This was assigned an Early-Late Ludlow (Late Silurian) age (Garratt 1983) with some suggestion that the base may lie within the Wenlock stage (Garratt *et al.* 1984). Garratt's stratigraphy is not currently accepted by the Geological Survey of Victoria (Edwards *et al.* 1997). However, the Geological Survey publications are inconsistent. Some maps (VandenBerg 1997a, 1997b; McDonald 1997) equate part of the Yea Formation with the near-shore Late Silurian Melbourne Formation and the rest with the siltstone of the Humevale Formation, both proximal or shelf facies (Sandford 2000, 2002); neither of these correlations is consistent with the lithology. On the other hand, it has also been stated that 'the Yea and Humevale formations in this area are now considered part of the lithologically variable Norton Gully Sandstone' (Edwards *et al.* 1997, p. 23) which is not older than late Pragian

(VandenBerg 1975). At least this correlation is consistent with the distal turbidite and shale lithology, but ignores any palaeontological evidence.

In summary, the stratigraphy of the Yea area remains a matter of controversy as much as does the age of the sediments. Figure 1 of this paper should be compared with previous maps (Couper 1965; Garratt 1978; McDonald 1997; VandenBerg 1997b) for some idea of the current differences of opinion.

Localities

Specimens of *Pleurodictyum megastoma sensu lato* have been found at the following locations within the Yea area:

PL6700 Murrindindi Road

This is a low cutting on Murrindindi Road some 1.5 km south of the triple junction with Langs and Frog Ponds Roads and 10 km south of Yea. The bed in which the coral was found is a 7.5 m thick diamictite mass-flow deposit consisting primarily of mudstone with rare (< 0.1%) well-rounded pebbles and shale rip-up clasts. The rich shelly fossil assemblage includes the brachiopods *Boucotia australis* (Gill), *Leptostrophiella affinalata* (Gill), *L. alata* (Chapman), *Hysterolites lilydalensis* (Chapman), *Hipparionix major* Gill, *Australina lenticulata* (Philip) and *Tyersella typica* Philip, the bivalves *Praectenodonta raricostae* Chapman and *Cypriocardinia crenistria* G and F Sandberger, the ostracode *Velibeyrichia wooryallockensis* (Chapman), a species of the trilobite *Kettneraspis*, as well as proetid, aulacopleurid, acastid and phacopid trilobites, tentaculitoids and a rostroconch. The diamictite overlies a thinly laminated shale containing *Baragwanathia longifolia* Lang and Cookson, and is in turn overlain by thin-bedded siltstone and claystone. A similar though less well-preserved shelly assemblage occurs on strike to the south (loc. PL6764).

The illustrated specimen from PL6700 (Figs. 2, 3) is a mould of an almost complete corallum about 17 mm diameter containing 8 or 9 corallites, the largest of which has a maximum width of 7 mm. Part of the wrinkled basal holotheca has also been preserved. The measurements are

comparable with those recorded by Neil (1985). Another more fragmentary specimen from this locality has also been found. The locality has been mapped as Rice's Hill Sandstone (Garratt 1977, 1978) and as Melbourne Formation (VandenBerg 1997a; McDonald 1997), both of which have been assigned Ludlow (Late Silurian) ages. However, the lithology is inconsistent with either of these units. Moreover, the fossil assemblage reported here is characteristic of the Early Devonian of central Victoria, in particular the Late Lochkovian-Early Emsian of Lilydale-Seville-Woori Yallock, Tyers and Tabberabbera. It may be possible to give a more exact age determination when the tentaculitoids are extracted; however, the preservation of specimens so far recovered is not sufficient for positive identification.

PL6769 Quarry Hill

This is a sandstone turbidite outcrop on the east side of the Quarry Hill ridge, near the junction of the Yea and Goulburn Rivers, 5.5 km north of Yea. The basal bed of the outcrop is remarkable for the large size of the fossil shell fragments and rip-up clasts, in comparison with other Yea turbidites. Shell fragments of *Leptostrophiella affinalata* (Gill) are abundant, and other fossils in the assemblage include *Notanoplia* cf. *pherista* (Gill), *N.* cf. *philipi* Garratt, *Maoristrophia keblei* Gill and *Australina lenticulata* (Philip). *Notanoplia* cf. *pherista* is also found at nearby locality PL6765 considered here to be at the same stratigraphic level. The notation 'cf.' indicates here that these notanopliids may in fact be *Boucotia australis* with the differentiating characteristics not preserved because of the coarse matrix.

The illustrated specimen from this locality (Fig. 5) is a fragment of a mould of a younger corallum than the previous. The maximum width of the only intact mature corallite is 5.5 mm. There are other specimens from this locality that may also be *P. megastoma*, but these have the corallites slightly smaller and more regularly shaped than is normally seen in this species. It is possible that these are ecotypes.

The locality has been mapped as Yea Formation in a sketch map (Garratt 1978) and as Humevale Formation (VandenBerg

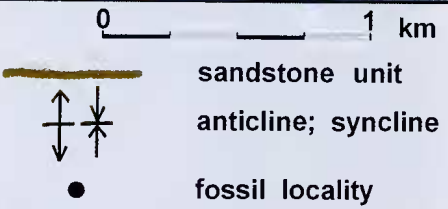
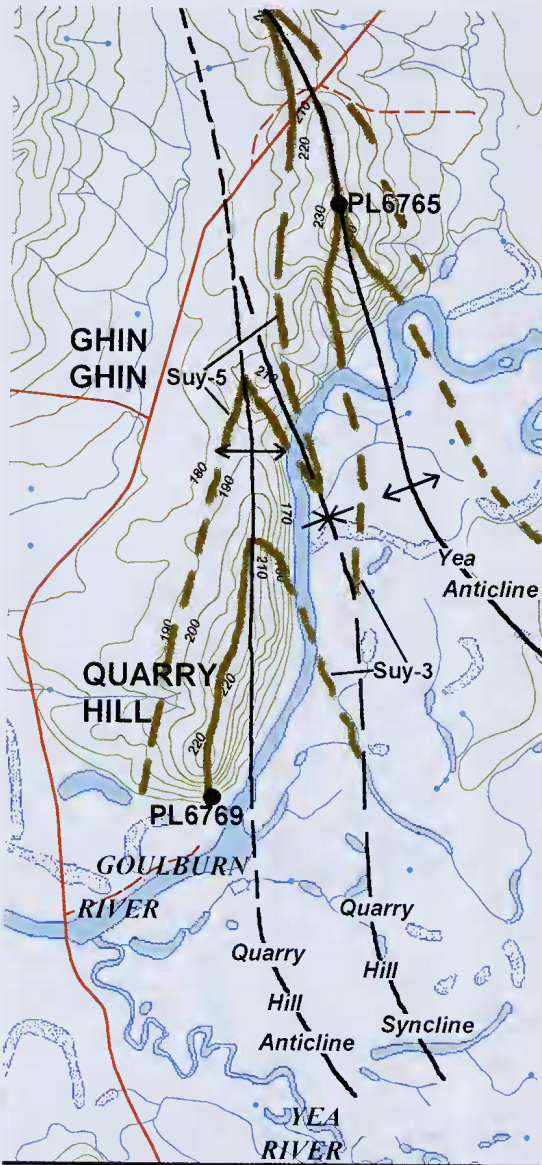
1997a; McDonald 1997). However, the structure of this area differs considerably from that shown in these published reports. Prowse and Finlay (1988) mapped a previously unreported anticline along the ridge. This study has confirmed the existence of the anticline, and a syncline that separates it from the Yea Anticline a little further to the east (Fig. 4). I consider the turbidite outcrop to be a repeat of one of the marker sandstone turbidite members of the Yea Formation, here labelled Suy-3, and to be stratigraphically lower than PL6700. However, the fossil assemblage, and in particular the occurrence of triseptate notanopliid brachiopods, indicates that the age is still Early Devonian (Garratt and Wright 1988).

PL6775 Grant's Track

This is an outcrop in a gully off Grant's Track, Black Range State Forest, Murrindindi. The fossils occur in discontinuous thin lenses (possibly lag deposits) at the base of one fine-grained siltstone bed. Complete to almost complete brachiopod and gastropod shells are not uncommon. The assemblage includes unidentified species of the brachiopods *Gypidula*, *Macropleura* and *Leptaena*, and acastid and phacopid trilobite fragments. A notanopliid brachiopod similar to (but probably not identical with) *Notoparmella plentiensis* Garratt is also present.

The illustrated specimen (Fig. 6) is a mould of an almost complete corallum about 25 mm in diameter containing seven corallites, the largest of which has a maximum width of 10 mm. This specimen is also comparable in size with those recorded by Neil (1985).

The only previous record of fossils from this general area (the former Murrindindi goldfield) is a mention by Smyth (1869). The position of the locality is currently erroneously mapped as hornfels and on the wrong side of the Yea Anticline (VandenBerg 1997b). The outcrop is in a siltstone unit underlying Yea Formation marker unit Suy-3, and is therefore stratigraphically lower than PL6769. The absence of *Boucotia australis* and the presence of a notanopliid similar to *Notoparmella plentiensis* (Late Silurian: Garratt & Wright 1988) indicate a possible age range from Late Silurian to earliest



Early Devonian; this is consistent with the stratigraphy.

A problematic specimen
 I must also note that the Museum Victoria collection of *P. megastoma* contains a mould of a large complete corallum (NMV P61758) in black fine-grained siltstone. Originally in the Creswell Collection, this is labelled 'From Yea presented by Miss Mary Taylor'. The lithology does not closely resemble any I have seen around Yea. At the time this specimen would have been collected, around the beginning of the twentieth century, the Taylors owned land in the area between Mt. Bullamalita and the Yea River. The limited natural outcrops in this area are generally of sandstone or slate, not at all resembling the matrix of this specimen. The Sunny Hills, Canadian and Halfway gold mines were operating in this area at that time, so it is possible it may have come from underground. But given the lack of a specific locality, this specimen is treated as being of doubtful provenance and is not considered further.

The type and age of *P. megastoma*

What age can be assigned to *P. megastoma*? In order to answer this question, it is first necessary to determine the type specimens because none has previously been designated. The original description (McCoy 1866) did not say anything about the new species other than 'ayant des cellules d'un

Fig. 4. Sketch map of the Ghin Ghin area showing structure, stratigraphy and fossil localities. Map base edited from digital topographic maps T7923-1-2-4 and T7923-1-3-1 downloaded from www.land.vic.gov.au. Standard legend for Victoria 1:30000 series maps applies in addition to the legend above. Suy-3 and Suy-5 label sandstone units within the Yea Formation.



Fig. 2. *Pleurodictyum megastoma* specimen NMV P312893 from loc. PL6700, Murrindindi Road. View showing the corallites ($\times 2$).



Fig. 3. Counterpart of specimen NMV P312893 showing a fragment of the concentrically wrinkled basal holotheca ($\times 2$).



Fig. 5. *Pleurodictyum megastoma* specimen NMV P312894 from loc. PL6769, Quarry Hill, Ghin Ghin. View showing the corallites ($\times 2$).

demi pouce de diamètre' ('having some cells half an inch in diameter'); no locations or types were mentioned. A later list of McCoy's Victorian fossils (in Smyth 1874) states that *P. megastoma* is from 'Upper Yarra', which in those days meant anywhere upstream from Warrandyte. The specimens were collected by government geologists in 1856 and given to McCoy for determination.

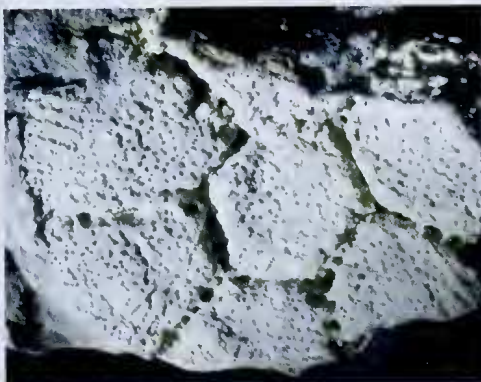


Fig. 6. *Pleurodictyum megastoma* specimen NMV P313991 from loc. PL6775, Grant's Track, Murrindindi. View showing the corallites ($\times 2.2$).

Chapman (1903) examined McCoy's specimens and found them to come from two localities. One, from a locality numbered B16 (NMV PL1875), he initially thought to have come from Kilmore, but this was later corrected (Chapman 1921). The real locality is described as '1½ miles downstream from Simmon's Bridge Hut on the Yarra'. The position of this locality is not known today, although Tom Darragh (pers. comm.) believes the bridge was near the old Tarrawarra railway station. Besides *P. megastoma*, the Museum Victoria collections include a number of other fossils from this site, including the brachiopod

Plectodonta bipartita. This, together with the lithology of the matrix surrounding the specimens, indicates that this locality is in the Humevale Siltstone of Lochkovian (Early Devonian) age.

The second locality, numbered B23 (NMV PL1834), is described as 'near Stewart's Station, junction of Woori Yallock Creek and Yarra River.' The position of this well-known locality has been described by Gill (1945). It is in the Yeringberg Formation of latest Pragian or early Emsian age (Sandford 2005).

I have re-examined McCoy's specimens for this study. Of the specimens from the first locality, it can be said that they are relatively immature, small, with few corallites, and more or less incomplete. The specimens from the second locality are larger and much more mature. The largest of them, a complete corallum NMV P340, was figured by Chapman (1903, Plate XVI, figs. 2, 4, 5), who noted that it had corallites up to 13 mm across – just a little over half an inch. It is likely that this is the specimen that so impressed McCoy with the size of its corallites that he decided to erect a new species. NMV P340 is here designated as the lectotype in order to establish a single name-bearing type for the species *Pleurodictyum megastoma* McCoy. Specimens NMV P341-345 from PL1834 and P346-348 from PL1875 are here designated paralectotypes. Plusquellec, who has studied *Pleurodictyum* and similar corals for many years, informs me (pers. comm. 2007) that he considers *P. megastoma* to be a species of *Ligulodictyum*, and had independently reached the same conclusion regarding the selection of lectotype.

Specimens of *P. megastoma sensu lato* have been reported from the Norton Gully Sandstone at Mansfield (Dun 1898) and from the Kilgower Member at Tabberabbera (Talent 1963), both of which are regarded as having the same age as the Yeringberg Formation (VandenBerg 1988).

Although the type would therefore be of Pragian-Emsian (Early Devonian) age, there are numerous reports of it from older sediments, down into the Silurian.

VandenBerg (1988) claims the oldest specimens come from the Bullung Siltstone of the Matlock area, which ranges

from Late Wenlock to Early Ludlow. However, the fauna occurs in the upper part of that formation and may therefore be Ludlow. There are numerous reports from near Kilmore and Wandong (Dun 1898; Chapman 1903, 1921) which are probably from the Late Wenlock to Early Ludlow Yea Formation. Specimens from Kilmore locality Bb20 (PL1674) were figured by Talent (1964), who thought that there were differences from *P. megastoma sensu stricto* and declined to assign them definitively to the species. This locality contains the internationally recognised index fossil *Monograptus ludensis* and is therefore definitely Late Wenlock in age (Rickards and Sandford 1998).

Conclusions

The occurrence of *P. megastoma* and associated fossils at localities north and south of Yea demonstrates the continuity of the Siluro-Devonian sediments of the Yea area with those occurring elsewhere in central Victoria.

Pleurodictyum megastoma does not in itself contribute to the controversy over the age of the Yea sediments, because although the type appears to be of Early Devonian age, specimens reportedly belonging to this species have in the past been obtained from sediments as old as Wenlock (Middle Silurian).

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